INDOOR AIR QUALITY ASSESSMENT

Berkshire Community College
Koussevitzky Arts Center
1350 West Street
Pittsfield, MA

Prepared by:
Massachusetts Department of Public Health
Bureau of Environmental Health
Indoor Air Quality Program
May 2017

Background/Introduction

Building:	Koussevitzky Arts Center (KAC)
Address:	1350 West Street, Pittsfield, MA
Assessment Requested by:	David Moran, Director of Facilities, Berkshire Community College (BCC)
Reason for Request:	Concerns regarding respiratory irritation and general indoor air quality (IAQ)
Date of Assessment:	April 27, 2017
Massachusetts Department of Public Health/Bureau of Environmental Health (MDPH/BEH) Staff Conducting Assessment:	Jason Dustin Environmental Analyst/Inspector IAQ Program
Date of Building Construction:	1970's
Building Description:	Two-level concrete building consisting of classrooms, auditorium, art rooms, and office space.
Building Population:	The KAC has approximately 13 employees with members of the student body visiting on a daily basis. The KAC also contains a 500 and 110-seat theatre which are used by BCC and outside groups.
Windows:	Openable

Methods

Please refer to the IAQ Manual and appendices for methods, sampling procedures, and interpretation of results (MDPH, 2015).

Results and Discussion

The following is a summary of indoor air testing results (Table 1).

- ***Carbon dioxide*** measurements were below the MDPH recommended level of 800 parts per million (ppm) in the majority of areas surveyed indicating adequate fresh air exchange at the time of assessment.

- ***Temperature*** was within the MDPH recommended range of 70°F to 78°F in all areas visited.
- ***Relative humidity*** was within the MDPH recommended range of 40% to 60%.
- ***Carbon monoxide*** levels were non-detectable in all areas tested.
- ***Particulate matter (PM2.5)*** concentrations measured were below the National Ambient Air Quality (NAAQS) level of 35 $\mu g/m^3$ in all areas surveyed.
- ***Total volatile organic compounds (TVOCs)*** were not detected in the building at the time of assessment.

Ventilation

Most areas of the KAC do not have mechanical ventilation and instead rely on natural ventilation through open windows and doors. The testing room (K213) and the adjunct faculty space (F202) were both equipped with supply and exhaust ventilation (Pictures 1 and 2). The testing room supply ventilation appeared to have weak flow. BCC facilities staff noted a hole in the ductwork that supplies this area and reported that they plan to repair it.

Properly functioning supply and exhaust ventilation are important to dilute and remove indoor air pollutants. Occupants should be encouraged to use open windows and doors for ventilation. Windows and screens were found to need repairs to prevent pest access when windows are open (Picture 3; Table 1).

Microbial/Moisture Concerns

Several active leaks were noted during the visit, specifically in room K213 (main area), the K210 hallway, and the Theatre (Pictures 4 through 6). BCC Facilities reported that a roofing company is in the process of locating and repairing these leaks. BCC Facilities staff use fans to dry occupied areas when leaks occur; however, a slight musty odor was noted in the K210 hallway which may be an indication of chronic water damage. Consideration should be given to replacing this carpet.

Measures should be taken to ensure water-damaged materials are cleaned, replaced, and/or repaired in a manner consistent with the U.S. Environmental Protection Agency's guidelines (US EPA, 2008). The US EPA and the American Conference of Governmental

Industrial Hygienists (ACGIH) recommend that porous materials (e.g., ceiling tiles, gypsum wallboard, carpeting) be dried with fans and heating within 24 to 48 hours of becoming wet (US EPA, 2008; ACGIH, 1989). If not dried within this time frame they should be removed/discarded.

Most of the building components in the KAC are made of concrete which is not conducive to mold growth. BEH/IAQ staff did note accumulations of powdery white material on ceilings in some areas (Picture 7). The white material is called efflorescence; efflorescence is a characteristic sign of water damage to building materials such as brick, mortar, or plaster, but it is not mold growth. As moisture penetrates and works its way through masonry products or concrete, water-soluble compounds dissolve, creating a solution. As the solution moves to the surface of the mortar/concrete, water evaporates, leaving behind white, powdery mineral deposits. This condition indicates that water from the exterior has penetrated into the building. Plaster, concrete, and brick do not typically support mold growth because these materials are not carbon-based; however paint or debris on the wall, or items stored nearby that are moistened, may become mold-colonized. When present, efflorescence can be cleaned.

Bird waste and nesting materials were noted on the ledge outside of windows in room K214A (Picture 8). Birds and bird wastes can be sources of allergens and microbial contamination. The bird waste should be removed to avoid entrainment of this material when the windows are opened.

Several areas contained plants, some of which had debris in the drip pans (Picture 9, Table 1). Plants can be a source of pollen and mold, which can be respiratory irritants to some individuals. Plants should be properly maintained and equipped with drip pans to prevent water damage to porous materials. Plants should also be located away from air diffusers to prevent the aerosolization of dirt, pollen, and mold.

Other Concerns

Other conditions that can affect IAQ were observed during the assessment. Exposure to low levels of total volatile organic compounds (TVOCs) may produce eye, nose, throat, and/or respiratory irritation in some sensitive individuals. To determine if VOCs were present, BEH/IAQ staff measured levels of TVOCs and examined rooms for products containing VOCs. While levels of TVOCs were non-detect, BEH/IAQ staff noted hand sanitizers, cleaners/wipes,

air deodorizers, and dry erase materials in use within the building (Pictures 10 and 11; Table 1). All of these products have the potential to be irritants to the eyes, nose, throat, and respiratory system of sensitive individuals. In particular, dry erase notebooks are used during exams in the Testing Room. Individuals with respiratory sensitivities (e.g., asthma) may experience increased symptoms if a large number of students are using the dry erase markers without adequate ventilation.

Renovations were being performed in/near the F202 Adjunct Faculty space to build an elevator machine room (Picture 12). Although slight paint odors were noted, no TVOCs were detected, nor were any TVOCs detected when multiple photocopies were made. Because F202 was equipped with mechanical ventilation it had adequate air exchange. The BEH/IAQ program guidance "Methods Used to Reduce/Prevent Exposure to Construction/Renovation Generated Pollutants in Occupied Buildings" is included as Appendix A for more information on performing these renovations in occupied buildings (MDPH, 2006). At the time of the visit, these guidelines appeared to be being followed.

Some areas had personal fans and air purifiers which should be cleaned and maintained according to manufacturer recommendations. Certain air purifiers (electrostatic precipitators or ionizers) should be avoided since they may produce ozone which is a known lung irritant (US EPA, 2003).

Accumulated items were observed on windowsills, tabletops, counters, bookcases and desks. The large number of items stored in these rooms provides a source for dusts to accumulate. These items, (e.g. papers, folders, boxes) make it difficult for custodial staff to clean. Dust can be irritating to eyes, nose, and respiratory tract. Items should be relocated and/or be cleaned periodically to avoid excessive dust build up. Many rooms have dry erase boards and/or chalk boards. Accumulations of debris in the trays can become aerosolized and cause irritation.

Conclusions/Recommendations

In view of the findings at the time of the assessment, the following is recommended:

1. Continue to ensure all water leaks are fixed promptly and remove any water-damaged porous materials (e.g., ceiling tiles, carpet, gypsum wallboard) that were not dried properly within 24-48 hours.

2. Make repairs to the ceiling in K210 hallway after leak has been repaired. Consider replacing the carpeting in this area as it may be water-damaged or mold-colonized.
3. Continue with plans to repair the hole in the supply ventilation ductwork leading to the testing room (K213).
4. Consider consulting with an HVAC design engineer to install building-wide mechanical ventilation in the KAC.
5. Remove any bird waste/nesting materials that are outside of openable windows.
6. Continue to follow MDPH guidelines (Appendix A) concerning renovations while building is occupied.
7. Ensure that occupants are aware of procedures to report leaks and other maintenance conditions so that they can be logged and repaired promptly.
8. Make necessary repairs to windows/screens and encourage occupants to open windows to increase ventilation. Ensure windows are closed tightly when rooms are not in use.
9. Move plants away from any air streams in classrooms. Avoid over-watering or placing them on porous materials (e.g., cloth, paper) and remove debris from drip pans and clean them periodically.
10. Reduce the use of or eliminate products containing VOC's in classrooms (harsh cleaners/wipes, hand sanitizers, etc.). Ensure adequate ventilation in the testing room during large exam groups which utilize dry erase notebooks.
11. Eliminate the use of scented items, including air deodorizing sprays and plug-ins to prevent respiratory irritation.
12. Personal fans and air purifiers should be cleaned/maintained according to manufacturer recommendations. Avoid any air purifier that may produce ozone, a known lung irritant.
13. Relocate or consider reducing the amount of materials stored in rooms to allow for more thorough cleaning. Clean items regularly with a wet cloth or sponge to prevent excessive dust build-up. Encourage occupants to report any areas that need improvement in general housekeeping as it will improve overall IAQ.
14. Clean chalk and dry erase trays regularly to remove dust and debris.
15. For buildings in New England, periods of low relative humidity during the winter are unavoidable. Therefore, scrupulous cleaning practices should be adopted to minimize common indoor air contaminants whose irritant effects can be enhanced when the relative

humidity is low. To control for dusts, a high efficiency particulate arrestance (HEPA) filter equipped vacuum cleaner in conjunction with wet wiping of all surfaces is recommended. Avoid the use of feather dusters. Drinking water during the day can help ease some symptoms associated with a dry environment (throat and sinus irritations).

16. Consider adopting the US EPA (2000) document, "Tools for Schools", as an instrument for maintaining a good IAQ environment in the building. This document is available at: http://www.epa.gov/iaq/schools/index.html.

17. Refer to resource manual and other related IAQ documents located on the MDPH's website for further building-wide evaluations and advice on maintaining public buildings. These documents are available at: http://mass.gov/dph/iaq.

References

American Conference of Governmental Industrial Hygienists (ACGIH). 1989. Guidelines for the Assessment of Bioaerosols in the Indoor Environment. American Conference of Governmental Industrial Hygienists, Cincinnati, OH.

MDPH. 2006. Massachusetts Department of Public Health. "Methods Used to Reduce/Prevent Exposure to Construction/Renovation Generated Pollutants in Occupied Buildings". Available at: http://www.mass.gov/eohhs/gov/departments/dph/programs/environmental-health/exposure-topics/iaq/pollution/renovate/constructionrenovation-pollutants-prevention.html.

MDPH. 2015. Massachusetts Department of Public Health. Indoor Air Quality Manual: Chapters I-III. Available at: http://www.mass.gov/eohhs/gov/departments/dph/programs/environmental-health/exposure-topics/iaq/iaq-manual/.

US EPA. 2000. Tools for Schools. Office of Air and Radiation, Office of Radiation and Indoor Air, Indoor Environments Division (6609J). EPA 402-K-95-001, Second Edition. https://www.epa.gov/iaq-schools.

US EPA. 2003. "Ozone Generators that are Sold as Air Cleaners: An Assessment of Effectiveness and Health Consequences". US Environmental Protection Agency, Office of Air and Radiation, Indoor Environments Division, Washington, D.C. https://www.epa.gov/indoor-air-quality-iaq/ozone-generators-are-sold-air-cleaners

US EPA. 2008. "Mold Remediation in Schools and Commercial Buildings". Office of Air and Radiation, Indoor Environments Division, Washington, DC. EPA 402-K-01-001. September 2008. Available at: http://www.epa.gov/mold/mold-remediation-schools-and-commercial-buildings-guide.

Picture 1

Supply air diffuser in Testing Room (K213)

Picture 2

Wall-mounted return vent in (K213)-paper shows it drawing effectively

Picture 3

Screen not attached to window frame

Picture 4

Active water leak above light fixture in room K213

Picture 5

Buckets used in room K213 to catch active water leaks

Picture 6

Water-damaged ceiling in K210 hallway

Picture 7

Efflorescence (white deposits) on concrete ceiling

Picture 8

Bird waste and nesting debris outside of window in room K214A

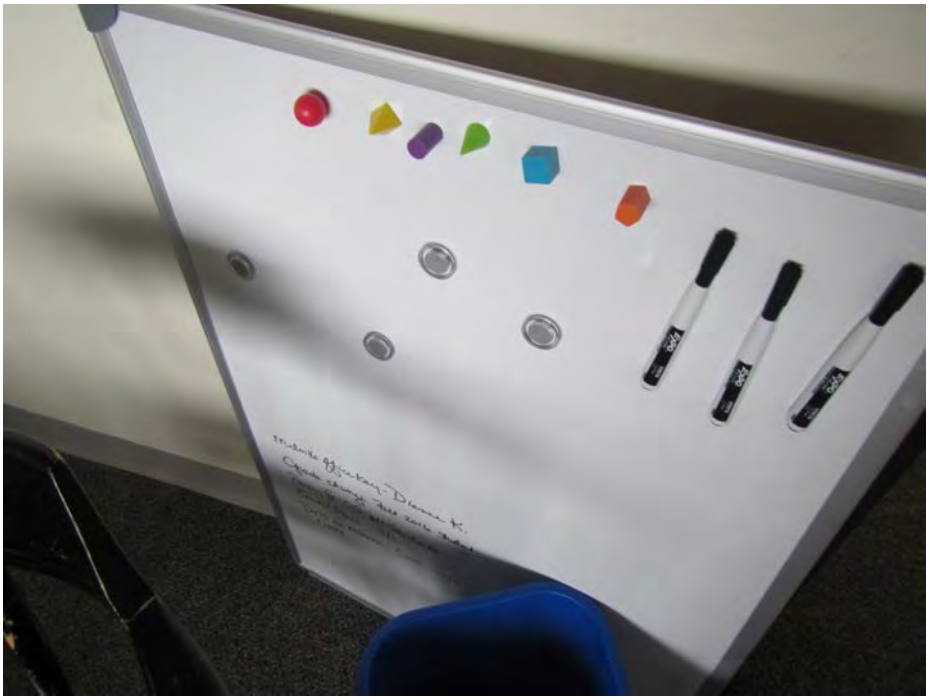
Picture 9

Plant showing rotting leaves/debris in drip tray

Picture 10

VOC-containing cleaning wipes

Picture 11



Dry erase materials

Picture 12

Elevator machine room renovations near Adjunct Faculty space (F202)

Location: Berkshire Community College-Koussevitzky Arts Center

Address: 1350 West St Pittsfield, MA

Indoor Air Results

Date: 4/27/2017

Table 1

Location	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)	Temp (°F)	Relative Humidity (%)	PM2.5 (µg/m^3)	TVOCs (ppm)	Occupants in Room	Windows Openable	Ventilation		Remarks
									Intake	Exhaust	
Background	349	ND	63	69	5	ND	-	-	-	-	
Costume storage	-	-	-	-	-	-	-	-	-	-	Slight musty odor, some porous items stored on floors, historic WD box
F202- adjunct faculty space	649	ND	71	54	3	ND	4	Y	Y	Y	Newly renovated (~2yrs), renovation to build elevator machine room, slight paint odors but no TVOCs detected
K104	468	ND	76	49	3	ND	0	Y open	N	N	Humidifier (w/fragrance), carpet
K107	409	ND	77	44	2	ND	0	Y	N	N	Carpet, AF
K110- Theater	507	ND	77	44	5	ND	6	N	Y	Y	AC being repaired, some active water leaks, slight musty odor
K117- Art	377	ND	73	49	4	ND	3	Y	Y	Y	AI, solvents under vent hood

ppm = parts per million
µg/m^3 = micrograms per cubic meter
ND = non detect
AC = air conditioner
AF = air freshener
AI = accumulated items
DEM = dry erase materials
FCU = fan coil unit
HS = hand sanitizer
TVOC = total volatile organic compounds
WD = water damage

Comfort Guidelines

Carbon Dioxide: < 800 ppm = preferred
> 800 ppm = indicative of ventilation problems

Temperature: 70 - 78 °F
Relative Humidity: 40 - 60%

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Table 1 (continued)

Location	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)	Temp (°F)	Relative Humidity (%)	PM2.5 (µg/m^3)	TVOCs (ppm)	Occupants in Room	Windows Openable	Ventilation		Remarks
									Intake	Exhaust	
K205	498	ND	77	46	3	ND	1	Y	N	N	Previous sewer odors in abandoned vent have been addressed, windows need repair to open easily
K206A	384	ND	76	47	3	ND	0	Y	N	N	AI
K207	380	ND	76	46	2	ND	4	Y	N	N	Plant, HS, AF, carpet
K210- Hallway	-	-	-	-	-	-	-	-	-	-	WD-ceiling/carpet, musty odor
K213- Testing	822	ND	77	48	2	ND	5	N	Y weak	Y on	Active roof leaks (drainage issues), WD, buckets to catch water, DEM, booklets used for testing, some chalk dust
K213A	633	ND	76	47	5	ND	1	Y	N	N	Slight musty odor (possibly carpet), HS, Lysol wipes
K213B	684	ND	73	54	7	ND	1	Y	N	N	DEM, Lysol wipes, air purifier, carpet, WD window sill from plant

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									Intake	Exhaust	
K213C	445	ND	76	48	3	ND	1	Y open	N	N	WD paper (possible past high humidity), dust on surfaces
K213D	848	ND	77	44	2	ND	0	Y	N	N	Plants
K213E	821	ND	78	43	3	ND	0	Y	N	N	DEM
K213F	805	ND	78	43	3	ND	0	Y	N	N	AI
K213G	693	ND	76	48	2	ND	3	N	N	N	Carpet about 7 years old
K214	902	ND	75	50	3	ND	14	Y open	N	N	Plants carpet worn/soiled
K214A	668	ND	77	44	2	ND	4	Y	N	N	Windows only ventilation, FCU, Tile floor, Bird waste on window ledge

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